laboratoire commun CEA/DSM — spiral2 — CNRS/IN2P3

PhD proposal 2017

Research field: Experimental nuclear and atomic physics

Subject: Ground state properties of trapped radioactive isotopes

Description:

This PhD subject aims at developing a trap-based system which will be part of the S3 – Low Energy Branch (S3 LEB) apparatus, to measure the ground state properties of radioactive isotopes produced by fusion-evaporation and transfer reactions.

S3 is the Super Separator Spectrometer, which will be one of the workhorses of SPIRAL2 at GANIL for producing N=Z and super-heavy elements (among other exotic nuclei) by fusion – evaporation and transfer reactions. The S3- Low Energy branch consists in a gas cell which stops and neutralizes the reaction residues. The isotopes of interest are then selectively laser – ionized, and then cooled by buffer gas, mass separated and bunched in successive RFQs. Finally the PILGRIM spectrometer permits an unambiguous identification of the isotopes produced and a rapid and accurate mass measurement of the isotopes of interest. The spin, nuclear moments and charge radii of the isotopes are optionally determined by laser spectroscopy at the gas cell. The measurement of these ground state properties (masses, spins, nuclear moments and charge radii) is of foremost importance for studying nuclear structure far away from stability.

The RFQs are being developed at LPC Caen. The student will have to commission these RFQs first off-line and then on-line at GANIL. Their characteristic performances, consisting in transmission, and bunching efficiencies and mass resolving power will have to be determined. The RFQs will then have to be coupled to PILGRIM. During the thesis, the student will be associated to measurements of some of the ground state properties, in particular masses of exotic isotopes using PILGRIM at GANIL. The S3 LEB is developed in collaboration between different groups from France (LPC Caen, IPNO, GANIL), Belgium (IKS Leuven) and Germany (Greifswald university) and will attract other physicists from Europe. Good communication skills are therefore recommended.

Expected skills: Skills in instrumentation, numerical methods, and communication will be valued, as well as curiosity.

"Master day" on Saturday the 26th of November to present the laboratory, the facility and PhD proposals. Programme and registration at http://pro.ganil-spiral2.eu/job-offers/stages-theses

Contact information

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